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PROFESSIONAL BIOGRAPHY OF MONCURE ROBINSON.

This biography is a reprint of the Professional Biography of Moncure Robinson by R. B. Osborne, C. E., which was privately printed in 1889. The editors have been able to find but one copy of the original and that is in the John Crerar Library of Chicago. The little book being so scarce, the editors have decided to reprint it without any change. It tells the story of a very remarkable man, one of the most distinguished civil engineers of the 19th century, not only in America, but abroad. He graduated from William and Mary College at a very early age, and had the courage to select the career of a civil engineer, a calling at that time hardly recognized in America as a profession. His experience was unusual, in that it covered the early canal and railroad building period. He married Charlotte Randolph, daughter of Bennett and Susan Beveley (Randolph) Taylor, and granddaughter of Edmund Randolph, first attorney general of the United States. He left five sons and three daughters. For special help and courtesy in securing information about Moncure Robinson, the editors wish to thank his son, Dr. Beverley Robinson, of New York City. For his descendants, see Hayden's *Virginia Genealogies.*

A record of the professional career of Mr. Robinson, one of America's most eminent engineers, as well known in Europe as in his native land, is due to the profession of which he is the honored senior member. This duty has been undertaken voluntarily, and without even asking Mr. Robinson's permission, by an engineer officer who commenced his own career in one of Mr. Robinson's corps of engineers, and who has served him professionally in every responsible position, on important public works, at intervals during a space of forty years, and who is cognizant of many of the incidents mentioned herein.

Mr. Moncure Robinson is a native of Virginia, a State that has been the mother of so many men whose names are enrolled among the most celebrated and honored of our country. He is the eldest son of the late Mr. John Robinson, of the well-remembered firm of Moncure, Robinson & Pleasants, merchants, of Richmond, Virginia, formerly engaged in an extensive foreign and South American trade.[1]

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[1] Moncure Robinson died in Philadelphia Nov. 10, 1891, in his 90th year.

Born in Richmond, Virginia, in the year A. D. 1802, Mr. Robinson is now, therefore, in his eighty-sixth year. Fair health and unusual energy enable him still to exercise the sound judgment and penetrating foresight for which throughout his life he has been noted.

When he was but six years old his education commenced, in the Gerardine Academy, under the leadership of Mr. Gerardine[2] a French gentleman of high literary attainments, and at the age of thirteen he entered William and Mary College, the oldest university in the country after Harvard. Augustine Smith, M. D., A. M., Professor of Political Economy, was then President, with Professor Campbell, Professor of Mathematics,—also Professors Wood and Fremont; the latter, the French Professor, was the father of the present General Fremont. From him young Robinson acquired such a perfect knowledge of the French language that in after years it was a passport for him to the halls and studios of the Paris savants. Young Robinson advanced rapidly in all the mathematical and scientific branches, and when sixteen years of age, although then the youngest student in William and Mary College he had passed all his examinations in preparation for graduating as A. M.

Mr. John Robinson, his father, was desirous he should enter on the study of law, but young Robinson, though he had exhibited talents already in that direction, in the defence which he had been selected to make in behalf of certain students of the college who were accused of holding revolutionary principles, yearned more after physics than Blackstone's Commentaries, which, however, he had studied, and which proved of aid to him in the profession he finally adopted.

In the year 1818 the Board of the Public Works of Virginia decided to have a topographical survey and connected line of levels made across the entire State from Richmond to the Ohio River. This presented a fine opportunity to the mind of the young aspirant, Robinson, and he immediately applied for a position in the corps of engineers to be appointed for the explorations. On account of his youth, his application was refused, but young Robinson was not to be turned from his purpose, and by perseverance got permission to accompany the party as a volunteer and sort of supernumerary.

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[2] This was L. H. Girardin, at one time professor of modern languages in William and Mary College, and a joint author of the 4th volume of Burk's *History of Virginia.*

Receiving no pay, he found himself in the very position that suited him. Independent of routine work, well mounted on his own horse, he could gratify his ambitious will, studying the great topographical features of the country, while he left others to work out the minor details. The services thus rendered by the young volunteer soon were found to be essential, and, in place of being a follower, he really became a leader in the party.

The country through which the party then had to pass was a most difficult one for such explorations. Young Robinson, though not of a very robust constitution, bore the privations and exposures manfully, and the services rendered were so much appreciated by the commissioners that his very youth, coupled with his being a volunteer bearing his own expenses, were adjuncts of no little value to his early reputation.

During this exploration young Robinson made many friends and acquaintances, that were of great benefit to him subsequently in his professional career. He and one of his fellow college-students were the mathematicians of the party.

This exploration was made under the general direction of Messrs. More, of Maryland, and Briggs, of New York. These gentlemen were not engineers, but were men of strong good sense.

The route specially examined crossed the Alleghany Mountains near the head-waters of the Greenbrier River, where the explorers launched their boats, brought with them on wheels by experienced boatmen selected from the James River. From the Greenbrier by New River the party reached the Great Kanawha, and proceeded down it to Gallipolis at its mouth, on the Ohio, where the services of the boatmen and boats were dispensed with.

Mr. Robinson, during the getting up the details of the field-work, visited extended districts, which, by reason of their field-duties, the other members of the party had no opportunity of doing, and in his long rides he startled many of the quiet residents by his mysterious pioneer movements. One of these, Philip R. Thompson,[3] in what is now known as the Charleston district, was the dispenser of hospitalities to him for many days, and was exuberant in his joy as his guest expatiated on the resources of his State, in the future development of which this exploration was a preliminary step. Mr. Thompson's residence thus was for the time Mr. Robinson's head-quarters, from which he explored the great coal-fields of West Virginia, and made valuable reports thereon, to take back with him to Richmond, describing much that had not been understood before, and showing the large quantity of the undeveloped wealth of the state. It was at this time that Mr. Robinson made surveys of the so-called Indian fortifications and corrected the erroneous popular idea, showing that they really were the remains of Indian storehouses, and not fortifications.

Mr. John Robinson, the father of the subject of this sketch, was at this period owner of much landed property in West Virginia, but of its character and precise location he was ignorant. In the year 1819 his son Moncure prepared himself for a second exploration, and went in the saddle through the north-western portion of the State, and made a careful reconnoissance of the valleys of the Cheat and Alleghany rivers to Pittsburg, for the purpose of hunting up and locating his father's wild lands; and on his return visited the valley of the Monongahela, where General Braddock was defeated, and, proceeding thence to Harper's Ferry, made good his return to Richmond. This was a ride on horseback of several hundred miles, at the age of seventeen.

In the year 1812, Mr. Robinson paid a professional visit to the Erie Canal, then being constructed, and, through the courtesy of Goveror De Witt Clinton and Canvass White, was given full opportunities of inspecting its plans, and becoming thus familiar with the details of that great work, by which he was able to form an early estimate of the ability of canals as competitors of railroads. Unbiased by the subsequent mania that took possession of the public mind after the completion of this canal in 1825, when canals in general found their stock worth from three to six times their original value, Mr. Robinson remained the steady advocate, save under special conditions, of the construction of railroads instead of canals.

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[3] This was Philip Rootes Thompson, a member of the House of Delegates from Kanawha in 1818/19. He was later a member of the 7th, 8th and 9th Congresses.

In the year 1821, Mr. Robinson, being about nineteen years of age, was employed by Governor Pleasants, of Virginia, to make the location for a short extension of the James River Canal, which was then about three miles above Richmond, and as chief engineer he widened the first portion, and then extended it about thirty miles, acting under the general manager, Randolph Harrison, the owner of the Dover estate.

Subsequently it was proposed to still farther extend this canal for a distance of two hundred and fifty miles to Covington, the head of boat-navigation, and the governor again called on Mr. Robinson to undertake the construction. But after well weighing matters as to the advantages of making such extension, Mr. Robinson earnestly advised against the construction of the proposed canal extension, and strongly advocated the building of a railroad in lieu thereof, with gradients suited to its prospective traffic. This was in 1821, when Clay and Sergeant were the political leaders, and a little after the Territory of Missouri had been brought into the confederation as a slave State. Mr. Robinson had made up his mind about the comparative capabilities of railroads and canals, and tried to save his State from the grave error contemplated in the construction of this canal to Covington, and he most strenuously urged on the authorities the great advantages to be gained by the adoption of his views, and, failing to convince them, respectfully declined to take part in the proposed extension of the James River Canal.

In the year 1825, Mr. Robinson, being about twenty-three years of age, went to France for the purpose of becoming professionally acquainted with the public works of that country, especially its harbors, and to attend during the winter the lectures of the learned professors of the mathematical, scientific, and philosophical branches. In the summer he visited also England and Wales, and, becoming acquainted with the leading engineers of these countries, had the opportunity of gaining a large amount of experience not obtainable in any other way, during the nearly three years in which he devoted his whole time to those pursuits.

In the summer of 1825, the first year of Mr. Robinson's visit to Europe, he carried out his determination of seeing that part of Holland most interesting to the engineer, its low countries, now in the kingdom of the Netherlands,—a flat and depressed country gently sloping toward the German Ocean, originally a series of banks of sand exposed to floods from the Rhine which deposited large quantities of alluvial debris from the Swiss mountains. This district is now protected from the waves of that sea rolling in on a higher level by the world-renowned dikes, that stretch along the coast for one hundred miles, joining the natural sandhills to the north, which rise to an altitude, in places, of one hundred and seventy-five feet over the ocean-beach level. These dikes generally are about thirty feet in height, though in places they rise to twice that elevation. They are planted on each side with trees, between which the public roads and the canals of the country have been constructed.

The Dutch have had a widespread notoriety for their patient industry, exemplified, it is said by their formation of these dikes, and Mr. Robinson has ever given them due credit for the exercise of this virtue. But after full investigation of the coast and its local characteristics, under the great processes of nature, by its storms, floods, and tides, he has given a far more correct solution of a problem that seems to have puzzled other professional visitors to this country,—of the real cause of these persevering and laborious people being able to achieve such extraordinary results, in the formation and preservation of these extensive dikes, that dam out the German Ocean from the Low Country, and turn marshes and barren sands into green fields and productive agricultural lands. The constructive and destructive powers of nature are irresistible by man's direct opposition, but working in the line of its own operations, man by his God-given wisdom can control these forces and render them great and powerful co-workers with him.

Mr. Robinson has shown that the long lines of sand-hills, to which these dikes are closely joined as continuous barriers against the inroads of the ocean, have through long-past ages been deposited there by the ocean itself in separate mounds, which the storms have from time to time made continuous by blowing the higher crests of sand into the intermediate spaces. This action of nature has occupied a long period of time, but the operation in its slow action continues; and, as he states, the accumulation and deposit from the ocean, and the retirement of the sea in some slight degree, alone supply the material for the formation of these dikes, and are the secret of their formation and preservation, the action of nature being only aided and guided and thus controlled by these hard-working and industrious people, who have learned by experience and watched carefully every opportunity of encouraging the work of their great co-operator, nature, and to secure and give form to every accumulation of sand deposited by the ocean. It is very evident that the large amount of material required for the formation of these dikes could only be supplied by the powers and processes of nature.

Accompanying these dikes are numerous windmills, which pump the water from the enclosed lands into the canals. The Haarlem Lake, which once contained an area of eighty-four square miles, with a depth of water of six feet, extending from the North Province into South Holland, scarcely existed three hundred years ago. Its increase farther over this area has been checked by the erection of dikes and dams. When Mr. Robinson visited that locality, he and his friends travelled on it for miles, and found villas on its banks and innumerable boats on its surface. He met here the Engineer of Works, who was then preparing for the erection of the three powerful steam-pumps for taking the water from Lake Haarlem, which have in the years since past effectually pumped out this lake and added forty-five thousand acres of arable land to the productive area of the country. Mr. Robinson visited many of the towns and villages in the interior, of which there are about a score, and remarked the peculiar cleanliness of the people, which he thought was the natural outgrowth of the abundance of water everywhere, and which thus became a second nature with the inhabitants.

Mr. Robinson, in this trip, was accompanied by Representative Crutchfield,[4] afterwards Speaker in the House of Delegates of Richmond, Virginia; also by a wealthy gentleman from Boston, largely connected with the commercial business of his city. Both of these gentlemen had earnestly solicited to be allowed to join Mr. Robinson, relying on him to act for them as interpreter. These gentlemen were well and favorably known to many influential parties in Amsterdam and Antwerp, and the chief men in both these cities were easy and agreeable. Public receptions in these cities were given to Mr. Robinson and his friends, and the young engineer, then twenty-three years of age, was afforded every opportunity of inquiry into the peculiarities, plans, and enterprises of the good people of Holland.

It was at this time that the authorities had matured their investigations of the question of reclamation from the sea of large tracts of land, and at a point near Amsterdam their attention was then particularly directed. Greatly interested in the plans proposed, and learning much from their valuable experience, Mr. Robinson has been gratified in following up the accounts of their proceedings and successes during the sixty years that have since elapsed. In that time the great land reclamation near Amsterdam has been perfected, more than eighty lakes in the North and South Provinces have been drained and many thousand of acres have been brought under the use and cultivation of man. These great results are due to man's perfecting his knowledge of the application of steam.

It was just at the time when the question that had already occupied so much of Mr. Robinson's attention was the chief topic in Europe for railroads were beginning to arouse the people from their long slumber. George Stephenson was progressing with his Liverpool and Manchester Railway, and earnest views of professional men regarding the character and utility of both classes of improvements were the order of the day. These fully confirmed Mr. Robinson in all that he had been advocating, and left him still in the hope that his own native State would learn wisdom from the lesson, and give up the extension of the James River Canal. He was acquainted with George Stephenson, then the rising star in the professional sky, and managed while in England to spend much of his time with him, and conferred with him about the tunnel then under construction at the Liverpool terminus of the Liverpool and Manchester Railway. In the latter part of 1827, Mr. Robinson returned to the United States.

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[4] Oscar M. Crutchfield of Spotsylvania.

Early in 1828 the canal commissioners of Pennsylvania called upon Mr. Robinson to make the surveys for the Pottsville and Danville Railway, with a view to the development of the anthracite coal-field. Stephen Girard, who was a large owner of coal-lands in the Mahanoy Valley, obtained the charter, and placed the same in Mr. Robinson's hands, ordering the construction of the road. Mr. Girard supplied two hundred thousand dollars for this construction during the first six months of its progress, but his death immediately after proved a preventive to its final completion according to the original plan, which was especially designed for the business proposed for it. The surveys were, therefore, not perfected in the manner contemplated to drain the Girard coal estate. It is certain that for a given business the use of water as a creator of power, and counter-balancing weight to return the empty cars, as brought into action on the cycloidal planes of this road by Mr. Robinson, regulated by stationary power at the head of each plane, would have proved efficient and economical. Three hundred thousand dollars were contributed by the State, and the planes as far as constructed for some three or four years passed about twenty thousand tons per annum. This coal was transshipped into boats on the Schuylkill Canal at Port Carbon.

In December, 1828, the canal commissioners of Pennsylvania appointed Mr. Robinson to make the survey for the Alleghany Portage Railroad. Starting from Hollidaysburg, this line crossed the Alleghany Mountains at Blair's Gap Summit with a tunnel one mile long and one hundred and forty feet lower than the work that has been constructed; thence the line descended to Johnstown in the Conemaugh Valleys, a distance of thirty-six and three-quarters miles. Connection was to be made with the canal-basins east and west, and there were to be five planes on each side of the summit. This tunnel would have cut through the bituminous coal of the Alleghany, which, it is thought would have been a better development of that region than has been attained since. Such a road, with one hundred and forty feet less elevation to be overcome, would have supplied a cheaper transportation for heavy freights and Western produce than is now in use. In the year 1829, Mr. Robinson had completed his survey of the Portage road and made his report thereon to the canal commissioners.

In 1830, Lieutenant-Colonel Long made a report to that board on examinations made by him for the same road, in which he advocated the construction of a macadamized road in preference to a railroad. His plan called for eleven planes of more or less curves in their located lines, and recommended the avoidance of the Summit Tunnel proposed by Mr. Robinson. These different plans and other routes proposed were, under an act of the legislature of March, 1830, referred to a board of engineers to examine and report on the several proposed routes and plans. These engineers reported in advocacy of the route chosen by Mr. Robinson, which Colonel Long had also adopted, with the modifications before mentioned. This report left the merits of Mr. Robinson's and Colonel Long's plans still at issue before the canal commissioners. On the 5th of March, 1831, Mr. Robinson made a second report to the canal commissioners, reviewing the proposed plan of Colonel Long, and referring them to his former report submitted to them in 1829.

The American Society of Civil Engineers, of which Mr. Robinson was made an honorary member of its organization, has printed, in pamphlet form of forty pages, these reports of 1829 and 1831, which are in vol. XV, of their Transactions, by reference to which it will be seen that this whole subject-matter of Colonel Long's plans has been so ably treated that it fully demonstrates that the project advocated by Mr. Robinson was the most advantageous and correct one submitted. It was endorsed by such men as John B. Jervis and Horatio Allen. In closing this report, Mr. Robinson, while regretting the difference of views between Colonel Long and himself, states that he felt it to be his duty to present the results of a very full investigation to the commissioners, who at once adopted his plans, though ultimately the Summit Tunnel, by reason of their timidity, was not constructed. Mr. Robinson's views were in fact too much in advance for the men of that period. The great French engineer, Michel Chevalier, subsequently visited the road, and he gave a very decided opinion that the avoidance of the tunnel which had been proposed by Mr. Robinson greatly impaired the efficiency of the whole work.

It was thus that Mr. Robinson, fifty-six years ago, had devised, and saw it put into execution, though shorn of its true efficiency, a plan for transporting loaded boats, from the canal at Hollidaysburg by rail over the Alleghany mountains, and, after a haul of thirty-eight miles, occupying about six hours, launching them again by a simple process into the canal basin at Johnstown, to proceed to Pittsburg. Here we find the pioneer thought for the production of a partnership between land and water transportation which Mr. Eads, in 1886, sought to enlarge upon in his scheme of a ship transit, via Nicaragua, between the Gulf of Mexico and the Pacific Ocean.

During their communication with him the commissioners consulted Mr. Robinson as to the best routes for the State railroad westward from Philadelphia, and by his advice Lancaster and Columbia were made points on that line.

In the year 1829, before Mr. Robinson entered upon the surveys for the Portage road, Mr. Stephens solicited him to accept the position of engineer-in-chief of the proposed Camden and Amboy Railroad, which he consented to do upon condition of having the appointment of all the officers of his engineering staff, and of being in full control of his department. These conditions were not agreeable to Mr. Stephens, and Mr. Robinson declined under the circumstances to accept the position.

In the year 1830, Mr. Robinson advocated and built in Virginia thirteen miles of railroad to reach the coal-fields of Heath and Mills which was perhaps the second railroad constructed in the United States the first being his Pottsville and Danville, under Stephen Girard. On this Virginia road there was an inclined plane, on which the gravity of descending cars was utilized for the ascent of the empty—a novel idea at that day, but an example that has been often followed since.

In 1831, Mr. Robinson was engaged in the contruction of the Petersburg and Roanoke and the Richmond and Petersburg railroads. On the latter road he built the long bridge at Richmond over the James River. This structure was 2844 feet in length, and to its grade line was 60 feet above the water. It was composed of nineteen spans, varying from 140 to 153 feet in the clear. The superstructure was lattice, chiefly composed of two-inch pine plank, and had but 1500 pounds of iron in the whole structure. Its cost was $117,200, or $41 per foot lineal, including masonry,—a limit Mr. Robinson found to be necessary, to suit the means of the company. The economical cost of such a structure for railroad use was commented on by foreign engineers, to whom it was little short of an enigma, yet it was a large sum in those days to expend on one structure, and it indeed was then considered a great enterprise. It was Mr. Robinson's forte to "cut his coat according to his cloth," and he acquired an enviable reputation for his ability to adapt his expenditures to the means at his command.

Michael Chevalier, the noted French engineer, in his work on the public improvements of the United States, published in 1840, gave the plans, cost, and full details of this bridge, and it attracted the attention of the profession generally, and from it has sprung the iron lattice bridge so much used now in Europe. Had the Richmond and Petersburg company been able to supply their engineer with means to build this bridge of iron it would be doing duty to-day. The original piers built by Mr. Robinson are now supporting an iron Warren super-structure.

These works were completed in the year 1832.

About the same time Mr. Robinson advocated and commenced the construction of that most successful railroad, the Richmond and Fredericksburg, also the Winchester and Potomac Railroad, with Harper's Ferry for its subjective point. The Richmond and Fredericksburg road is now the most important link in the great route to the South and South-west, and must continue to be so.

In the year 1838, Messrs. Thomas Biddle, William Keating, and Edward R. Biddle, of Philadelphia, conferred with Mr. Robinson about the construction of a line of railroad up the valley of the Little Schuylkill River, to develop the Tamaqua coal-field, and to be a feeder to the Schuylkill Canal, at Port Clinton, where the coal would be transhipped into the canal-boats by means of a lock at that place. This road Mr. Robinson built in 1833 and 1834, horse-power being used upon its till the completion of the Reading extension from Reading to Pottsville. When this extension was built, its tonnage reached tidewater by rail.

The next work to which Mr. Robinson was called was in 1834. This proved the crowning achievement of his professional career, —the Philadelphia and Reading Railroad, a work that is indelibly stamped for all time with the genius of its first engineer, in giving to it at that early day of railroads its distinctive features, which have endowed it with a power to transport economically the immense special traffic for which he designed it. In this road Mr. Robinson had a good opportunity of carrying out and elucidating those principles, and the rules he laid down for his own guidance, before any of the surveys had been commenced. He made the start from the true zero point, viz., a close investigation of the character and quantity of the trade present and prospective, in each direction.

There were few minds at that early day which had sufficient expansion of ideas and clear forethought to be able to anticipate how great an increase of business the work itself, when opened to the public, would create, and so to construct it that its capacity could be readily expanded to meet economically any increase of the demand. The questions determined by Mr. Robinson as the primary and necessary elements—viz., the alignment and gradients —were regulated for the most advantageous transportation of the great staple this road was destined to accommodate, and also for the economic conveyance of a large mixed traffic.

The Philadelphia and Reading Railroad well exemplifies the correctness of the principle named. Forty thousand tons of coal alone, in one day, have passed over its rails, yet it never has been tried to its full capacity, which may be said to be limited only to the number of car-loads the mines can supply. Mr. Robinson's estimate of seventy-five thousand tons per diem, as the ultimate prospective demand on its capabilities, made more than fifty years ago, was of course then considered Utopian, but it would now be deemed as much so to limit the capacity of the Philadelphia and Reading Railroad to any such quantity.

The rules laid down before the construction of this road, by Mr. Robinson for his engineers in charge of that work, were few and simple; and it is owing to the faithful adherence to those rules that the Philadelphia and Reading Railroad has been rendered prominent as the leader of all the great coal-transporters in the world.

The first of these rules required that from the coal region to Columbia Bridge over the Schuylkill, near Philadelphia, no grade should be adopted more difficult for the locomotive than a level.

Secondly, that all other grades, which must therefore be descending with the grade, should not exceed nineteen feet per mile; by which Mr. Robinson insured that whatever number of loaded cars an engine could take down to the terminus it would be able to bring back empty to the coal region.

The third rule prescribed that the shortest radius of curvature on the main line should be eight hundred and eighteen and fifty-seven hundredths feet, or seven degrees.

In 1834, Mr. Robinson obtained the charter for the extension of this road from Reading to Pottsville. Into this charter there had been inserted an objectionable clause, excluding foreign stockholders from the right of voting, to which narrow-minded policy Mr. Robinson strenuously objected.

He also got a charter during this year, to extend the Richmond and Fredericksburg Railroad to Acquia Creek, containing the same most liberal provisions as were embodied in the charter for the first portion of that road.

In 1836, Elihu Chauncey, who was the first President of the Philadelphia and Reading Railroad, which position he held for nine years, prevailed on Mr. Robinson to undertake a visit to England, to confer with London capitalists and negotiate a loan for the completion of this railroad, including its extension to Pottsville. Leaving Mr. Wirt Robinson as engineer-in-chief, and Wilson Miles

Cary Fairfax as principal assistant, both of which gentlemen were relatives of Mr. Robinson and efficient engineers, he visited London in this year, being then in the thirty-fourth year of his age, and laid his plans and estimates, and his wonderful profile of grades, before Sir Francis Edgerton and his agent Mr. Licke.

Sir Francis made very close investigation of the whole matter, and was so impressed and convinced at his interviews with Mr. Robinson that he became greatly interested in him and his mission, which in itself was an assurance of its success.

Mr. Andrew Stevenson was then our Minister to England, and gave to Mr. Robinson the aid of his influence. During Mr. Robinson's stay in London, Sir Francis Edgerton gave him a special invitation to dinner where he met Lady Francis Edgerton, the Duchess-Countess of Sutherland, Lord William Bentinck, and Lord Bathurst.

Sir Francis Edgerton finally became the largest holder of a five-per-cent. loan to the Philadelphia and Reading Railroad Company for two millions of dollars, the first foreign loan negotiated for this company. Mr. Robinson had procured the well-known bankers Gowan & Marx of London, to negotiate it, and made Mr. Thomas Hankey (a gentleman well known in the United States, and the London representative of the house of Thomas Biddle & Co., of Philadelphia) its custodian. This loan was confined to two millions to leave room for home subscriptions.

A loan of one million for the extension of the road to Pottsville was also negotiated by Mr. Robinson, stipulated for on the condition of the railroad company having the obnoxious feature, of the exclusion of the votes of foreign stockholders, repealed.

Mr. Robinson went to London prepared to make his mission meet with the success it did, as he took with him the bonds he had had engraved before leaving Philadelphia, to prevent delay.

While in London Mr. Robinson became acquainted with England's noted civil engineers; among them was Isambard Kingdom Brunel, the builder of the famous Thames Tunnel, in which he was then engaged. With this gentleman Mr. Robinson became intimate, and conferred with him on important questions attending its construction. He was spending the day with Mr. Brunel when the intelligence was brought to him of the flooding of the works by the river breaking through its floor above a portion of the tunnel then being made. Mr. Brunel received the intelligence with perfect calmness, merely inquiring if any life had been lost. In the subsequent measures adopted to re-form the river bottom and free the work of water Mr. Robinson took a lively interest, and his views were consulted on the best mode of carrying out the various details and perfecting this difficult operation.

The Bell Rock Light-house, off the east coast of Scotland, was another notable work, the plans of which were submitted to Mr. Robinson, on the invitation of Mr. Stevenson, its talented engineer.

In the year 1837, on his return to the United States, Mr. Robinson found that the objectionable legislation in the charter for the extension of the Philadelphia and Reading Railroad had not been repealed; in fact, very few outside of the little circle named, who had been the pioneers and firm friends of this road with Mr. Robinson, took any interest in it, or believed there was sufficient intrinsic merit in the project to justify the construction of an expensive road alongside of an already existing canal that then controlled the coal-tonnage. Mr. Robinson was therefore, under the stipulation made in London for the second loan of one million, obliged to abandon it.

During Mr. Robinson's absence in England the construction of the Philadelphia and Reading Railroad had been progressing toward Reading under Principal Assistant Engineers W. M. C. Fairfax and W. Hasel Wilson, and the stone bridge across the Schuylkill River at Black Rock Tunnel had been completed. This structure was considered a bold enterprise at that day, with its four spans of seventy-two feet. It was remarkable then as being the first large stone structure in the United States built for a double-track railroad, and it is remarkable even now for the small cubic contents of its masonry,—3471 cubic yards. It has been sufficiently tested through its fifty years of service by more than three hundred millions of tons that have passed over it, as well as by severe freshets which have swept away many bridges in the Schuylkill Valley, but left it standing, a perfect specimen of engineering skill, of which Mr. Robinson is justly proud as one of his earliest works. The total cost of this bridge was $43,262,84.

On the fourth day of July, 1838, Mr. Robinson opened the Philadelphia and Reading Railroad between Reading and Norristown, through the Flat and Black Rock tunnels, 937 and 1932 feet long, respectively, and over the Black Rock Bridge before mentioned. These were great advances for those early days of engineering experience in railroad construction, the cost of these two tunnels aggregating $272.700.

Before the construction of that portion of the road from Bridgeport to the Columbia Bridge, a distance of eighteen miles, and a part of Mr. Robinson's perfect design for the Philadelphia and Reading Railroad, some of his directors proposed the abandonment of that portion, and advocated a connection with the Norristown Railroad, and by it to reach Philadelphia, but Mr. Robinson, who never would permit expediency to mar the plans laid down by him for the future prosperity of his work resolutely protested against a policy which he knew would obliterate practically the grand features which he had carried out on the rest of the road, and prevent the future success of the work he had thereby insured. The undulating grades on the Norristown road would have limited the effective power of the locomotives on the main line. When, therefore, the effort was persisted in to adopt that route for the Reading road against his advice and protestations, Mr. Robinson very plainly informed his board of directors that he would not be a party to what he could not but condemn as suicidal to the interests of the Philadelphia and Reading Railroad Company, and wished them to consider his resignation as their engineer before them whenever their resolution was passed ordering the change of the route laid down by him. Messrs. Chauncey, Keating, and Biddle, of the directors, sided with Mr. Robinson,, and thus the fatal error was avoided, and his original plan, without any interference, was ordered to be carried out.

Coincident with the opening of the road to Reading, the location of the extension to Pottsville was made by Mr. Robinson, with Wirt Robinson, Esq., as resident chief engineer, and W. M. C. Fairfax as principal assistant, in which a close adherence to the rules laid down by Mr. Robinson was carried out. A grade of twenty-six feet for three miles was required to reach Mount Carbon. The system of contouring which he had introduced on this line has since been extensively used by engineers in the United States. The result has been that the Philadelphia and Reading Railroad occupies the only ground through the Valley of the Schuylkill that can offer the especial grades that have made this road famous, and which will forever prevent any other railroad from being an efficient competitor in this valley.

The extension, bold in many of its characteristics to preserve the features required by its author, has a tunnel on it near Port Clinton of 1637 feet in length, which was of very difficult construction, also several important crossings of the Schuylkill River. This portion was opened for public traffic in January, 1842, and immediately the road began to exhibit its capabilities for transportation, soon relieving its company from financial embarrassment caused by the outlay for its construction.

While the construction of the road was proceeding from the Falls of Schuylkill toward the Columbia Bridge, then used by the Old State Railroad, the public were anxious to discover where and by what route Mr. Robinson contemplated making the great coal depot on the Delaware River for the shipment of the large anthracite tonnage. The excitement was great among those hoping to derive special advantage from a fore-knowledge of a selection of the site. Mr. Robinson, therefore, in the interest of his company, did not feel justified in having regular surveys made to guide him in the selection of the proper point. Convinced in his own mind, however, of the advantages of the present site of Richmond as the best location for the extensive wharves he contemplated he determined personally and without any staff of assistants to walk over the route from the Falls of the Schuylkill, which he did quietly and unobserved, and in that walk, unaccompanied, and without any instruments (it was before the invention of the aneroid barometer, odometer, or hand-level), but by the eye, the number of steps, and general judgment at each interval as he advanced, he satisfied himself, in a few hours of diligent work, that the Summit could be reached with the grade he wished to adopt, which would admit of the entire train brought down by each engine from the coal region being taken without stopping at the Falls, by the aid of an assistant engine stationed there, to the Summit, between the Schuylkill and Delaware rivers. Satisfied by his observations during this brief reconnoissance, Mr. Robinson notified his directors, advising them to secure possession at once of the land required; which they did by the purchase of that extensive and valuable tract now forming the site of Richmond, and of the great shipping depot of the Philadelphia and Reading Railroad. Thus by the sagacity and efficiency of their engineer the railroad company procured this important position on the port of Philadelphia at a reasonable price.

Mr. Robinson's talents as an engineer were ever ready in the service of his company, knowing well that when rightly used they can often effect a saving of many thousands of dollars. The capacity of the Richmond wharves for shipment he made equal to the capacity of the railroad itself for transportation.

In 1838 the firm of Eastwick & Harrison, of Philadelphia, machinists then in a limited business, were engaged to build for Mr. Robinson a locomotive engine of his own design, as an experiment, looking to the rendering of this important part of a railroad as perfect as he had already made the road on which it was to operate. This engine was a small affair, as we estimate locomotives in the year 1888, but it was not considered so then. Its cylinders were 12 7/10 by 16 inches, the boiler 39 5/10 inches in diameter; it had four drivers of 40 inches in diameter, and a new feature in its horizontal cylinders, a fire-box 52 inches long, through which the axle of the hinder pair of drivers passed. The weight of this engine was but 24,640 pounds, of which 17,690 pounds were on the driving-wheels, its total length was but 18 feet. It was named by Mr. Robinson, after his London banking friends, the "Gowan and Marx."

"On the twentieth day of February, 1840, the trial of this engine took place on the Philadelphia and Reading Railroad, when she passed from Reading over the road to Columbia Bridge, a distance of 54.50 miles, in 5.50 hours, or about 9.9 miles per hour. The gross weight of the train, including engine and tender, was 441 tons of 2240 pounds,—taking back all the empty cars, which with the weight of engine and tender equalled 174 gross tons.

Michel Chevalier, the French engineer, who under a mission from M. Thiers visited the country in 1833 to 1835, brought letters of introduction from French contemporaries to Mr. Robinson, asking his aid in furtherance of M. Chevalier's object, which Mr. Robinson assiduously and gladly rendered.

M. Chevalier published in 1840 his work on the "Lines of Communication and Public Works of the United States," which made them more accurately known to Europeans than they were even to ourselves.

In this publication, M. Chevalier especially noticed the performance of the "Gowan and Marx" engine, which at that time was considered by the engineers as unprecedented. This statement by M. Chevalier reached the Czar of Russia, and in that year he sent commissioners to visit the locomotive works of the United States, and instructed them to bear an offer from His Majesty to Mr. Robinson, looking to the procuring of his services as engineer over the grand system of railroads he was about to inaugurate for the Russian empire. Mr. Robinson gave aid and counsel gladly to these commissioners during their visit, but did not feel justified in acquiescing in His Majesty's views, not wishing to absent himself from his own country and his family.

It was on this occasion that the firm of Eastwick & Harrison were introduced to the Emperor's commissioners by Mr. Robinson, which resulted in the well-known engagement and ultimate contract with that firm who at once transferred their business to Russia, and returned in a few years to Philadelphia, with ample fortunes. Mr. Robinson's kindness to and appreciation of this firm were ever warmly felt and expressed by both of its members.

In the year 1842, during General Tyler's administration, the Secretary of the Navy appointed Mr. Robinson, in conjunction with Commodores Shubrick and Conner, as commissioners to examine and report on a proper site for the great dry-dock proposed to be constructed by the government in the harbor of New York. Fenimore Cooper solicited these gentlemen to delay their movements for a short time, till he could join them, which he subsequently did, and remained with them during their examinations.

Their head-quarters were in one of the government vessels, placed at their disposal in the harbor for their reconnoissances of the different sites, which occupied some months. Mr. Robinson was called upon to draw up the joint report, which was approved of, and fixed the site of this dock at Wallabout, where it now is.

In or about the year 1845 commissioners visited the United States from Prussia, and were instructed to obtain information from Mr. Robinson about railroads, which service was gladly performed, and for which he received due acknowledgments.

The last act of professional duty performed by Mr. Robinson was this reconnoissance in the New York harbor, and in 1847 he retired from the profession; though he has often since been consulted his advice has been given gratuitously. He preferred to use his already-acquired professional experience (backed by his own judgment and foresight) to guide him in making investments of the means already acquired in what he deemed would in the future prove to be productive improvements, conceiving it would be of more financial advantage to him than a further continuance in his active professional duty for others, and this was, moreover, urged by Mrs. Robinson.

It has been repeatedly asserted by engineer officers in Mr. Robinson's employ, that his system, and discipline, so well carried out, supplied an education of the very best description for civil engineers. The requirement of a strict obedience to general orders did not deprive them as officials of a proper manly independence, and they were left full opportunity for the exhibition of professional talent, in carrying out the same, each in his own way. Able officers in charge of the assistant engineers were willing teachers and advisers, and that peculiar education indispensable for fitting them for the highest positions, and performing successfully the most difficult duty a chief engineer has often to perform—viz., to manage his board of directors for their own good,—was not neglected. Hence the career of many of the engineers who had been employed by Mr. Robinson can be traced to positions and length of service alike creditable to them and their honored chief. Some of those engineers have been placed by him in important posts on his finished roads, and, through many honorable promotions, have proved faithful and efficient officers for more than fifty years.

The last work constructed by Mr. Robinson, under the immediate direction of William Moncure as chief engineer, is the Palmetto Railroad, an important though short link in the great Metropolitan route, which was conceived in his clear forethought more than fifty years ago. This Palmetto road is but eighteen and a quarter miles in length, but it does away with one of the hindrances to the earlier completion of this portion. The bridge over the Great Pedee River, near Cheraw, in South Carolina, at the head of navigation, about one hundred and fifteen miles from the Atlantic, has thus been built. It is a fine iron Pratt truss 614 feet in length, on stone piers 50 feet above the river, with trestled approaches aggregating 4000 feet lineal. There are four spans of 150 feet each, which were erected by the Phoenix Bridge Company, of Philadelphia, in forty-seven working days, at a cost complete of $26,836.

The Palmetto road serves as a continuance of the Seaboard Air-Line from Hamlet, North Carolina, to Cheraw, South Carolina, while the Raleigh and Augusta and its sister road, the Raleigh and Gaston, stretching up northward one hundred and fifty-six miles from Hamlet to Ridgeway, North Carolina, form a part of this Metropolitan route, under the presidency of J. M. Robinson, Esq., the eldest son of Mr. Robinson. At Ridgeway it connects with the only missing link to complete the connection with the Richmond and Petersburg road, a distance of seventy-five miles, which Mr. Robinson has also had put under construction.

At a very early date, under his fostering care and by his foreknowledge the Metropolitan route from Washington, D. C., to Augusta, Georgia, was devised and has been preserved, and by his energy and enterprise important portions of it—viz., the Richmond and Petersburg, and Richmond and Fredericksburg to Acquia Creek—have been constructed, bringing it within thirty-four miles of Washington, which gap has since been filled by the Alexandria and Fredericksburg road. In continuance of this plan, Mr. Robinson, in 1886, formed a company of his immediate friends, and resolved to bring the Palmetto road into operation as an incentive to the friends of the Metropolitan route, in South Carolina, to use their efforts for the extension of it by a direct line from Cheraw to Columbia, South Carolina, and subsequently to Augusta, Georgia. The completion of the Palmetto road has verified this expectation, as it has animated the people along the eighty-seven miles of prospective line to Columbia to make arrangements, by legislation, public meetings, and local and municipal subscriptions, for building this portion.

On December 3, 1887, after the opening of the Palmetto road, a paper on this work as a link in the Metropolitan route was read before the Engineers' Club of Philadelphia, of which Mr. Robinson is an honorary member. This paper will be found in the Proceedings of the club, in vol. I, No. 3.

One of the exceptions to the general advocacy of railway construction by Mr. Robinson, in preference to canals, is the Chesapeake and Delaware Canal, of fourteen and one-fourth miles in length, connecting these two navigable waters. In this work Mr. Robinson has large pecuniary interests. The fine steam-boat line between Baltimore and Norfolk, Virginia, known as the Bay Line, was established by him, and he is perhaps the largest stockholder in that company. It connects with the Seaboard and Roanoke Railroad, both companies being under his son, John M. Robinson, Esq., as President, these connecting with the route formed by the Raleigh and Gaston and Raleigh and Augusta, before mentioned.

John Robinson, the father of the subject of this sketch, married a daughter of William Moncure, Esq., of Richmond, Virginia. His son, Moncure Robinson, of whom we write, married in 1835, the daughter of Bennett Taylor, Esq. a graduate of Princeton College, and afterwards an eminent member of the bar, in Richmond, Virginia. After his marriage Mr. Robinson became a permanent resident of the city of Philadelphia, where he now resides. The American Society and the Philadelphia Club of Civil Engineers, together with societies of Paris, send him regularly the reports of their proceedings, and in them he takes much interest still.

The confidence now placed in the ability of civil engineers to mature works of magnitude, and the large means supplied for their expenditures, afford the bold and enterprising of the profession, at this date, opportunities to put into further practice the half-century of experience that has made the civil engineers in all countries the great leaders in the civil, political and civilizing influences that have hastened the wonderful progress of the world's advance in the latter part of the nineteenth century. The reverse of all this existed in 1820, when the subject of this sketch commenced his professional career. Then the civil engineer had to work uphill all the way, against prejudice and minds accustomed to travel in old and deep-worn ruts. Yet amid these impediments we find this young engineer, whose only capital was a sound liberal education, perfecting his scientific studies abroad, making himself familiar with the improvements of Europe, rising rapidly in the estimation of his countrymen, constructing some of the greatest works of that period, and, as an American engineer, solicited by Russia, France, and Prussia to devote his services to the development of their contemplated great systems of public improvements. Mr. Robinson thus is the first American engineer who received the recognition and appreciation of the rulers of Europe and those countries have learned that the continuance of that appreciation has been well merited since by American engineers.

One of the marked characteristics of Mr. Robinson was his courtesy and consideration towards his engineer officers. He gave fatherly counsel to some who were greatly benefited by it, and who bear it in mind to this day, and he extended a generous hand to those who needed it. During the year 1886 he travelled one hundred and twelve miles to attend the funeral of one who had filled important positions on one of his roads, and Mr. Robinson took his place among the chief mourners, and had a special car for the transportation of all his old associates who wished to share in the last record of appreciation of their departed friend.

The respect and deference paid Mr. Robinson by his own engineers, and by many others of the profession, have always shed a ray of sunshine across the quiet of his declining years.

RICHARD B. OSBORNE, C. E.

Philadelphia, December 24, 1888.